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10/628,956	07/29/2003	Hardayal Singh Gill	HSJ920030125US2	6171

7590 02/18/2004  
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EXAMINER

LE, THAO P

ART UNIT PAPER NUMBER

2818

DATE MAILED: 02/18/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/628,956

Applicant(s)

GILL, HARDAYAL SINGH

Examiner

Thao P Le

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 29 July 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-40 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 17-40 is/are allowed.
- 6) ☒ Claim(s) 1-16 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 29 July 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
- a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

DETAILED ACTION

1. Claims 1-40 are pending in this application.

**Claim Objection**

2. Claim 9 is objected to for the following reason:

Claim 9 states "wherein the allow of CoFe", whereas the word "allow" should be spelled "alloy". Correction is required.

**Claim Rejections**

***Claim Rejections - 35 USC § 102***

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

**4. Claims 1-7, 9 are rejected under 35 USC 102 (e) as being anticipated by Dieny, U.S. Pub. No. 2002/0061421.**

Regarding to claim 1, Dieny discloses the method of forming a magnetic junction device similar to what recited in claim 1. See Figs. 3, 7-8, and depending portions of specification. Dieny discloses the method of forming a magnetic junction device comprising the steps of forming a first magnetic layer F and a second magnetic layer R (Fig. 7), at least one of the first and the second magnetic layers including diffusion components selected to adjust one or more properties of the magnetic tunnel junction device (Page 2), and forming a barrier layer NM (Fig. 7) between the first and second magnetic layers, the barrier layer comprising migrated diffusion components from the at least one magnetic layer.

Regarding to claims 2-3, Dieny discloses the diffusion components are Hf or Zr which can adjust a series resistance of the magnetic tunnel junction or decrease a bandgap of the barrier layer.

Regarding to claim 4, Dieny discloses the forming of pinned magnetic layer and a free magnetic layer (Fig. 8).

Regarding to claim 5, Dieny discloses one or more of the first and the second magnetic layers comprise a multi-layer structure (Figs. 8, 11).

Regarding to claim 6, Dieny discloses one or more of the first or second magnetic layers comprise an alloy of CoFe (paragraph 0019).

Regarding to claims 7, 9, Dieny discloses that the magnetic layer comprises the transition metal or alloys of transition metal such as CoFe. It would have been inherent

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that Hf and Zr belong to transition metal groups and therefore CoFeHf and CoFeZr are transition metal alloys of CoFe (paragraph 0019).

### **Claim Rejections - 35 USC § 103**

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims, 8, 10-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dieny, U.S. Pub. No. 2002/0061421.

Regarding to claims 8, 10, 14 see Figs. 3, 7-8, and depending portions of specification, Dieny discloses the method of forming a magnetic junction device comprising the steps of forming a first magnetic layer F and a second magnetic layer R (Fig. 7), at least one of the first and the second magnetic layers including diffusion components selected to adjust one or more properties of the magnetic tunnel junction device (Page 2), and forming a barrier layer NM (Fig. 7) between the first and second magnetic layers, the barrier layer comprising migrated diffusion components from the at

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least one magnetic layer. Dieny discloses that the magnetic layer comprises the transition metal or alloys of transition metal such as CoFe.

Dieny fails to disclose the atomic percentage of Hf or Zr in the compounds and the thickness of the barrier layer. However, the selection of such parameters such as **energy, concentration, temperature, time, molar fraction, depth, thickness, etc.,** would have been obvious and involve routine optimization which has been held to be within the level of ordinary skill in the art. "Normally, it is to be expected that a change in **energy, concentration, temperature, time, molar fraction, depth, thickness, etc., or in combination of the parameters** would be an unpatentable modification. Under some circumstances, however, changes such as these may impart patentability to a process if the particular ranges claimed produce a new and unexpected result which is different in kind and not merely degree from the results of the prior art ... such ranges are termed "critical ranges and the applicant has the burden of proving such criticality.... More particularly, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." *In re Aller* 105 USPQ233, 255 (CCPA 1955). See also *In re Waite* 77 USPQ 586 (CCPA 1948); *In re Scherl* 70 USPQ 204 (CCPA 1946); *In re Irmischer* 66 USPQ 314 (CCPA 1945); *In re Norman* 66 USPQ 308 (CCPA 1945); *In re Swenson* 56 USPQ 372 (CCPA 1942); *In re Sola* 25 USPQ 433 (CCPA 1935); *In re Dreyfus* 24 USPQ 52 (CCPA 1934) (claims 8, 10, 14).

Regarding to claims 11-12, it would have been obvious to one having skill in the art to use Hf or Zr as diffusion components because Hf and Zr can adjust resistance of the junction and decrease the bandgap of the barrier layer.

Regarding to claim 13, Dieny discloses the formation of the first and second magnetic layers comprises forming at least one amorphous layer (Figs. 8, 11).

Regarding to claims 15-16, Dieny discloses the barrier materials can be any conducting metals having a sufficiently low resistivity (paragraph 0037) but fails to disclose that the barrier materials are either AlHfOx or AlZrOx. It would have been obvious to any person having skill in the art to use either AlHfOx or AlZrOx as barrier layer since either AlHfOx or AlZrOx have low resistivity and lower the bandgap of the barrier layer.

***Allowable Subject Matter***

7. Claims 17-40 are allowed.

8. Claims 17-40 are considered allowable since none of prior art teach or suggest claimed limitations having a method of forming a magnetic tunnel junction device comprising the steps of forming a first magnetic layer and a second magnetic layer whereas at least of the magnetic layers comprises diffusion components which can adjust one or more properties of the magnetic tunnel junction device, and a barrier layer between the magnetic layers, annealing to enhance migration of the diffusion components from the first magnetic layer to the barrier layer.

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9. When responding to the office action, Applicants' are advice to provide the examiner with the line numbers and page numbers in the application and/or references cited to assist the examiner to locate the appropriate paragraphs.

A shortened statutory period for response to this action is set to expire 3 (three) months and 0 (zero) day from the day of this letter. Failure to respond within the period for response will cause the application to become abandoned (see M.P.E.P 710.02(b)).

### **Conclusion**

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thao P. Le whose telephone number is 703-605-1187. The examiner can normally be reached on Monday-Thursday 7:30am-6: 30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Nelms can be reached on 703-308-4910. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9306 for regular communications and (703) 872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.



Thao Phuon Le

1/23/04



David Nelms  
Supervisory Patent Examiner  
Technology Center 2800